

# ORIENTED FILAMENTS OF AMYLOSE AND ALKALI AMYLOSE

Sir:

By deesterifying oriented potato amylose acetate we have obtained excellent fiber diagrams corresponding to A, B, V and branched chain alcohol-precipitated amylose powder patterns, and previously unreported alkali amylose. Heretofore only a B fiber pattern has been obtained.<sup>1</sup>

Alkali amylose is produced directly on deacetylation of clamped filaments at 25° in 2% potassium hydroxide solution in 75% methanol or ethanol or in saturated butanol. Contained alcohol is not an integral part of the fiber structure, since identical patterns are given by amylose prepared in the three alcohols, and also (with greater difficulty) in aqueous alkali. On extracting alkali from the filaments with absolute methanol, the fiber pattern disappears, and is not restored by humidification. Soaking in 75% alcohol containing 2% alkali restores the original pattern, whereas 75% alcohol alone produces the V structure. The fiber pattern (Fig. 1) can be indexed on the basis of an orthorhombic unit cell having  $a_0 = 9.0 \text{ \AA}$ ,  $b_0 = 22.7 \text{ \AA}$ , and  $c_0 = 12.7 \text{ \AA}$ , and containing twelve  $C_6H_{10}O_5(KOH)_x$  groups.  $x$  has not been established and may be variable, since the alkali uptake of the fibers giving this pattern depends on the alkali concentration in the deacetylating medium. Lithium, sodium and cesium hydroxide amylose have similar structure and composition.

Transformation of the alkali amylose structure to the V structure is effected most easily in 75% methanol, allowing the clamped filaments to contract 10 to 15%. The diffraction pattern is independent of the primary alcohol and shows a fiber repeat period of 8 Å. Lateral spacings vary with moisture content. Extraction of alkali with 75%

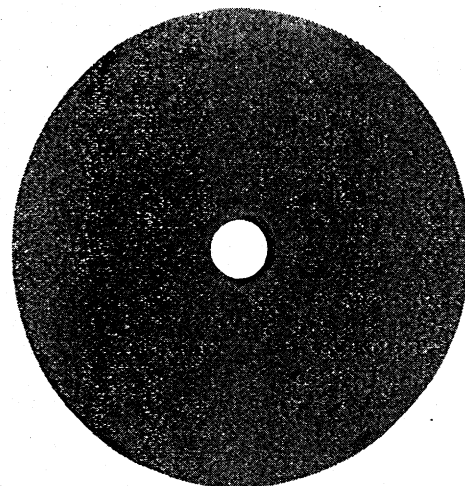


Fig. 1.—Fiber diagram of potassium hydroxide amylose. Fiber axis vertical, filtered Cu radiation, 5 cm. distance.

*t*-butanol results in a fiber pattern with similar fiber period, 7.9 Å., but lateral reflections are considerably shifted and indicate a monoclinic unit cell.

Filaments giving fiber patterns that correspond to the A (cereal starch) structure are obtained by exposing alkali amylose to high humidity (80%) for several days. The fiber identity period is 10.5 Å., at variance with the unit cell proposed<sup>2</sup> from powder patterns.

In saturated water vapor the A structure changes to the B (tuber starch) structure. Complete conversion and sharpest fiber patterns result from boiling vapor-treated filaments in water.

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(1) Rundle, Daasch and French, *THIS JOURNAL*, **66**, 130 (1944).

(2) Bear and French, *THIS JOURNAL*, **63**, 2298 (1941).